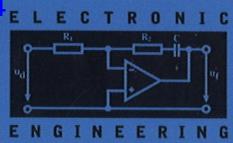


# **EXHIBIT 11**



# Printed Circuit Boards

DESIGN, FABRICATION,  
AND ASSEMBLY

- ✓ High density interconnects
- ✓ CAD/CAM techniques
- ✓ Laminates
- ✓ Soldering

---

R. S. Khandpur

*The McGraw-Hill Companies*

**Cataloging-in-Publication Data is on file with the Library of Congress**

Copyright © 2006 by The McGraw-Hill Companies, Inc. All rights reserved. Printed in the United States of America. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.

1 2 3 4 5 6 7 8 9 0 DOC/DOC 0 1 0 9 8 7 6 5

ISBN 0-07-146420-4

*Printed and bound by RR Donnelley.*

*This book was previously published by Tata McGraw-Hill Publishing Company Limited.*

McGraw-Hill books are available at special quantity discounts to use as premiums and sales promotions, or for use in corporate training programs. For more information, please write to the Director of Special Sales, McGraw-Hill Professional, Two Penn Plaza, New York, NY 10121-2298. Or contact your local bookstore.



This book is printed on recycled, acid-free paper containing a minimum of 50% recycled, de-inked fiber.

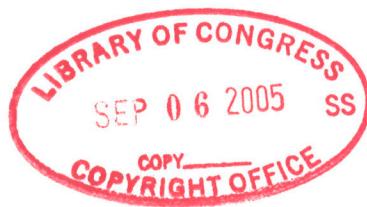
Information contained in this work has been obtained by The McGraw-Hill Companies, Inc. ("McGraw-Hill") from sources believed to be reliable. However, neither McGraw-Hill nor its authors guarantee the accuracy or completeness of any information published herein, and neither McGraw-Hill nor its authors shall be responsible for any errors, omissions, or damages arising out of use of this information. This work is published with the understanding that McGraw-Hill and its authors are supplying information but are not attempting to render engineering or other professional services. If such services are required, the assistance of an appropriate professional should be sought.

LC Control Number



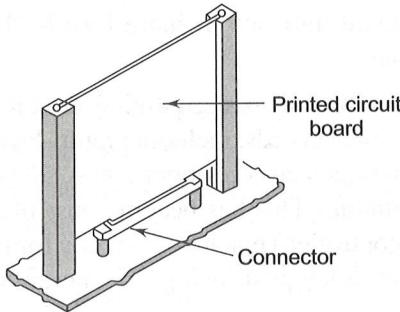
2006

272449

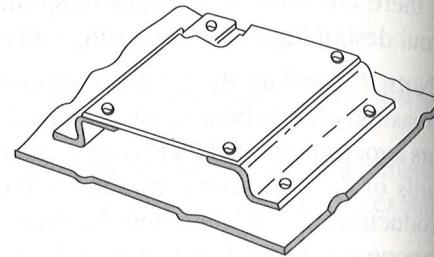


### 3.3.3 Board Guiding and Retaining

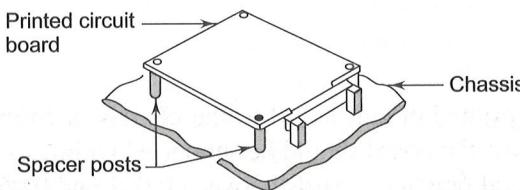
The most convenient method for use with plug-in printed circuit assemblies is that of card guides. They provide a quick connect/disconnect capability with the convenience of testing the board out of the units by means of extender cards. The type of card guide depends upon the shape of the board and the degree of accuracy needed to ensure proper mating alignment. Some of the commonly used card guides are shown in Figure 3.3. There must be sufficient area to allow room for the card guide along the edge of the board.



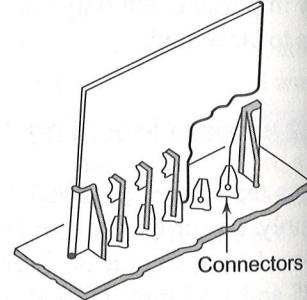
(a) Grooved posts and angle clamps  
The posts serve as guides as the board is lowered to the connector, then the clamps provide positive retention.



(c) Z angle brackets  
Z angle strips can be cut to receive any size board.



(b) Mount on tapped spacers  
Any size board can be accommodated by this simple mounting. It can be a space-saver on walls and doors of enclosures.



(d) Sheet-metal support guides  
Although not positively retained in place, boards are quickly removed and replaced.

**Fig. 3.3** Methods of mounting boards using card guides (a) grooved posts and angle clamps, (b) mount on tapped spacers, (c) z-angle brackets (d) sheet metal support guides (Lindsey, 1985)

If the electrical interface does not require a connector or a card guide is not practical, then mounting holes may be provided on the board so that it can be installed with screws, stand-offs or other mechanical fasteners. However, sufficient clearance should be provided so that components or conductors will not interfere or short-out to the mounting hardware. Adequate clearance

(1.5 to 2 through  
Additional  
flexing  
Stiffen  
Mounting  
avoid the  
the types

### 3.3.4

The most  
equipment  
particularly  
commonly  
part print  
printed ci  
The other  
contacts i

Double  
(receptacle  
part to an

Single  
generally  
discrete c